Is the Earth's Core Leaking?

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One would have thought that the core would be a perfect waste repository. The gravitational and chemical stability of the system which put the core in place should be quite difficult to upset. The core formation process should not run backwards. And yet there is some evidence that the core is now leaking a little bit. How this might happen is explored. One mechanism could be that the thermal solubility of material dissolved in the molten outer core decreases as the Earth cools. Solubility of oxygen-bearing ingredients would need to be high and to be prograde for secular cooling to be effective at dumping material out of the core back into the mantle. A different mechanism that reconciles some previously enigmatic observations involves the subduction of oxidized material from the Earth's surface to the core-mantle boundary. A process like titration precipitates oxides from the core's iron-rich substance as the result of the oxidizing subducted material reaching the liquid outer core. This process will be more effective if the solubility of solid oxides is low. Oxides produced from the core by either mechanism are lighter than the core and join the mantle. It is interesting to speculate that there is a feedback between oxygen-generating biological processes and deep-earth core-mantle chemical interactions. Choosing between these 2 possible mechanisms requires knowing whether FeO is highly soluble in core-like liquid Fe (and prograde) at a megabar - or not. Experiments to measure this high-pressure solubility are in progress on station 12.2.2 at the ALS.